

MICRON TECHNOLOGY, INC.  
INVENTION DISCLOSURE

Microsoft Proprietary

FEB 10 1993

INVENTOR(S): P.Fazan, G.Sandhu

NOV 06 2000

PATENT & TRADEMARK OFFICE

93-150

DESCRIPTION

DARPA project?No

2.1 Title of invention:

A SINGLE-CMP SHALLOW TRENCH ISOLATION PROCESS WITH PAD=GATE AND TRENCH EDGE SPACER ELIMINATION

2.2 Brief description:

Recently some interest appeared on trench isolation processes which use a pad = gate process and where the poly gate is deposited before the trench etch. Such a process is simple, and solves some issues found with the standard trench isolation process, such as sub Vt leakage and planarization. However, the pad=gate process suffers from a serious problem: during transistor formation, a spacer is created on the field oxide edge, reducing the AA available for successive contact formation. We propose here a new process flow to avoid this issue by recessing the field oxide in the trench.

2.3 Also attach a complete description, including drawings or sketches and articles relevant to the invention. Legible photocopies of laboratory notebooks are acceptable.

The process flow is described in Fig. 1 to 8 attached. A comparison with the standard pad = gate process is shown in Fig.9. Fig 9 clearly shows how a spacer formed around the field oxide edge closes the AA future cocontact area.

The improved process is as follows:

- a) Pad = gate ox. growth (Fig.1)
- b) Poly gate deposition, nitride CMP stop deposition (Fig.2)
- c) Si trench etch (Fig.3). A vertical or a sloped trench profile can be used.
- d) Trench fill with oxide and oxide CMP (Fig.4)
- e) Trench oxide recess (partial or full recess up to the Si surface) (Fig.5). This is the key step that allows the spacer issue to be eliminated. We also strip the nitride at this step.
- f) PolyB gate deposition and WSix deposition. The poly is needed to avoid the WSix adhesion issues. (Fig.6).
- g) Poly gates patterning (oxide can be added on WSix for a full flow) (Fig.7).
- h) Spacers formation (Fig.8).

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### 3.3 IMPORTANT DATES

- a. Has the invention been disclosed outside the company? No  
If yes, to whom, when, and in what form?
- b. Have any articles describing your invention been published?  
If yes, list author(s), title of article, publication and date. No.
- c. Have any engineering samples been given out? No If yes,  
to whom and on what date?
- d. Has any product using the invention been sold or offered for  
sale? No If yes, to whom and on what date?

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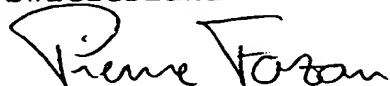
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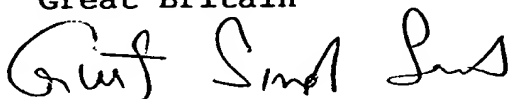
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November 2, 2000

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Michael L. Lynch, Esq.  
c/o Ms. Susan Sweesy  
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P.O. Box 6  
Boise, Idaho 83707-0006

Re: U.S. Patent Application Serial No. 09/386,646  
METHOD AND APPARATUS FOR TRENCH ISOLATION PROCESS WITH  
PAD GATE AND TRENCH EDGE SPACER ELIMINATION  
Your Disclosure No.: 93-0150.01  
Our Reference: 500055.02 (446602-660)

Dear Mike:

Enclosed for your files and records please find a copy of an Office Action in the above-referenced application and the Amendment filed in response thereto.

Very truly yours,

DORSEY & WHITNEY LLP

*Dale C. Barr*  
Dale C. Barr

DCB/ln

Enclosures:

As noted

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